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MLX90224

Dual Hall Effect Latch

Features and Benefits

- Chopper Stabilized Amplifier Stage
- CMOS for Optimum Stability, Quality and Cost
- Dual Output
- 4.5V to 28V Operation
- Phase/Direction Detection (B)
- Pulse Doubling Output (C)

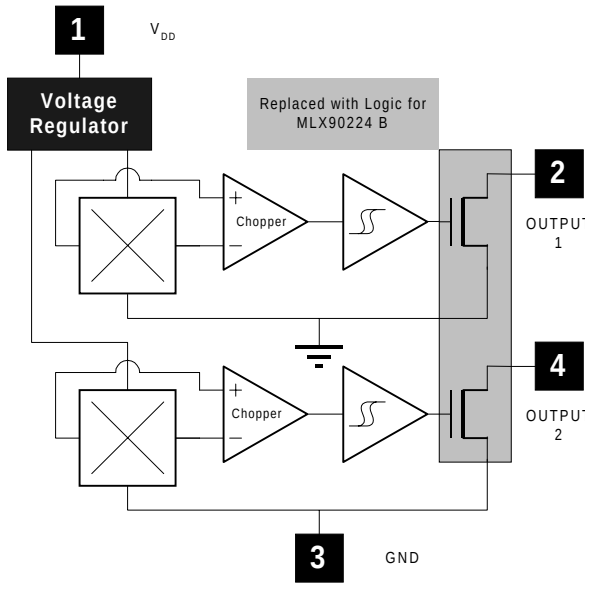
Applications

- Direction Detector
- Speed Sensor
- Shaft Encoding
- Position Sensing

Ordering Information

Part No.	*Temperature Suffix*	*Package*	*Temperature Range*
MLX90224 A	L	VA	-40°C to 150°C Automotive
MLX90224 B	L	VA	-40°C to 150°C Automotive
MLX90224 C	L	VA	-40°C to 150°C Automotive

Functional Diagram



Description

The MLX90224 series are dual Hall effect latches. It includes two Hall effect latch functions of which typical thresholds are +/- 2.0 mT. In each latch, the magnetic flux detection is performed by a switched silicon Hall plate. The B_{OP} and B_{RP} are temperature-compensated and give a sensitivity temperature coefficient of 500 ppm/°C to compensate popular magnets.

The MLX90224 A, C output transistor will be "latched on" (B_{OP}) in the presence of a sufficiently strong South pole magnetic field facing the marked side of the package. Similarly, the output will be "latched off" (B_{RP}) in the presence of a North field. Spacing on the plates is 1.85mm.

The MLX90224 B series are designed for direction detection with a high speed chopper which provides 15µs delay.

Note: *Static sensitive device, please observe ESD precautions.*

MLX90224 Electrical Specifications

DC Operating Parameters TA = -40°C to 150°C, VDD = 4.5V to 28V (Unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Voltage	V_{DD}	Operating	4.5	**5**	28	V
Supply Current	I_{DD}		5.0	**7.5**	10	mA
Output Current	I_{OUT}	B>B_{OP}			20	mA
Output Voltage	V_{SAT}	B>B_{OP} I_{OUT} = 20 mA		**200**	400	mV
Output Voltage	V_{OUT}	B<B_{RP}			28	V
Output Leakage	I_{LEAK}	B<B_{RP} V_{OUT} =V_{DD}			1.0	µA
Oscillator Frequency	F_{OSC}	MLX90224 A, B MLX90224 C		**200** **400**		kHz kHz
Refresh Time		MLX90224 A, B MLX90224 C		**15** **7.5**		µs µs

MLX90224 Magnetic Specifications

DC Operating Parameters TA = -40°C to 150°C, VDD = 4.5V to 28V (Unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Operate Point	B_{OP}	MLX90224 A, B MLX90224 C	0.5 25	**2.0** **25**	4.0 27	mT mT
Release Point	B_{RP}	MLX90224 A, B MLX90224 C	-4.0 23	**-2.0** **25**	-0.5 27	mT mT
Hysteresis	B_{hys}	MLX90224 A, B MLX90224 C	3.0 48	**4.0** **50**	5.5 52	mT mT

Notes: *1mT=10Gauss*

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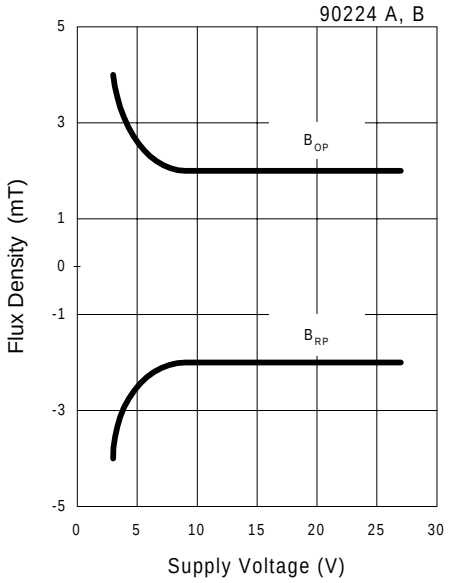
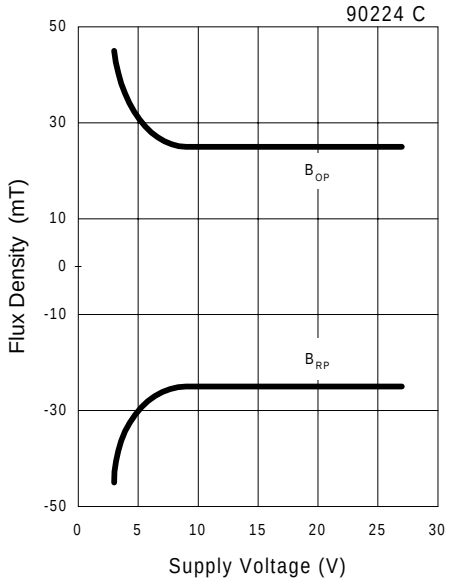
Performance Graphs

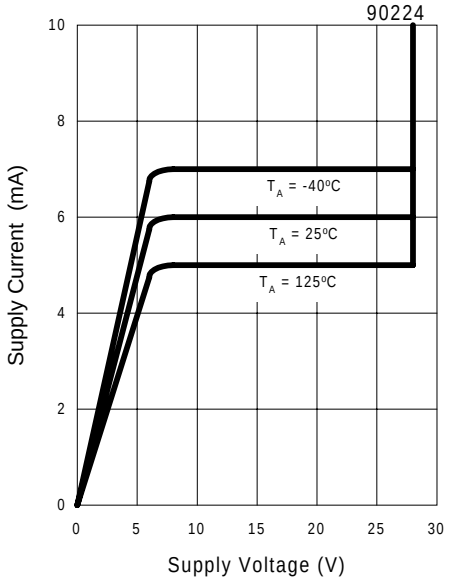
Typical Magnetic Switch Points versus Supply Voltage



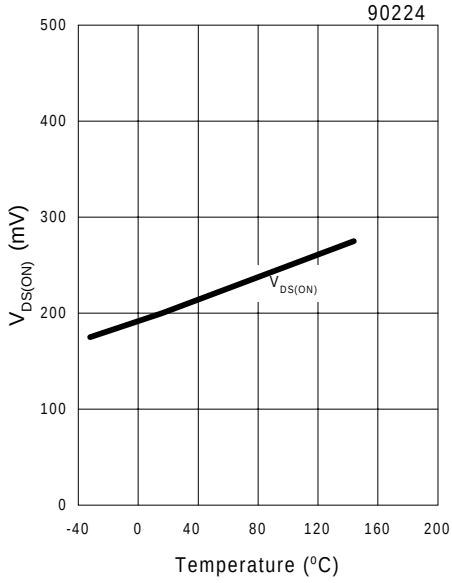
Typical Magnetic Switch Points versus Supply Voltage



Typical Supply Current versus Supply Voltage

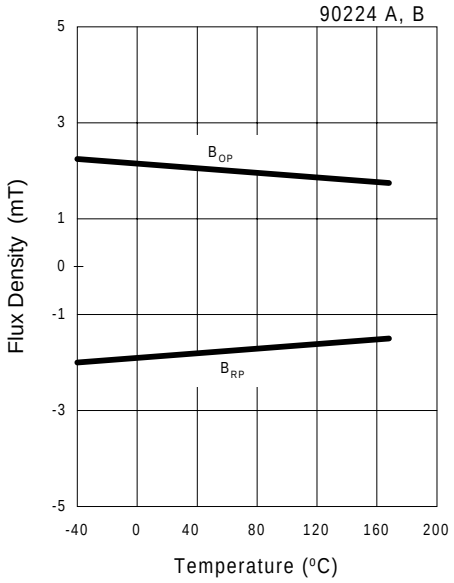


Typical Saturation Voltage versus Temperature
V_{DD} = 12 V, I_{OUT} = 20mA

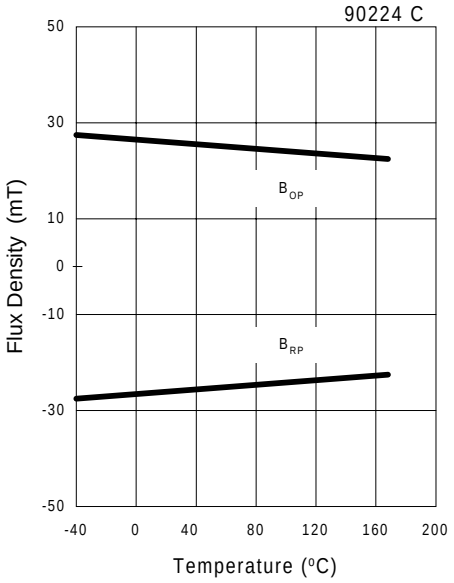


Performance Graphs

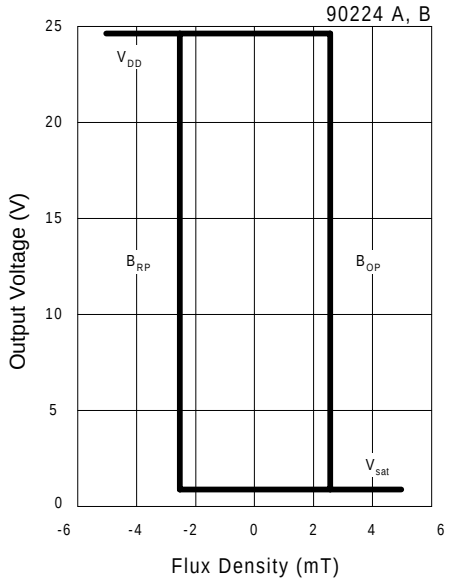
Typical Magnetic Switch Points versus Temperature



Typical Magnetic Switch Points versus Temperature



Output Voltage versus Flux Density



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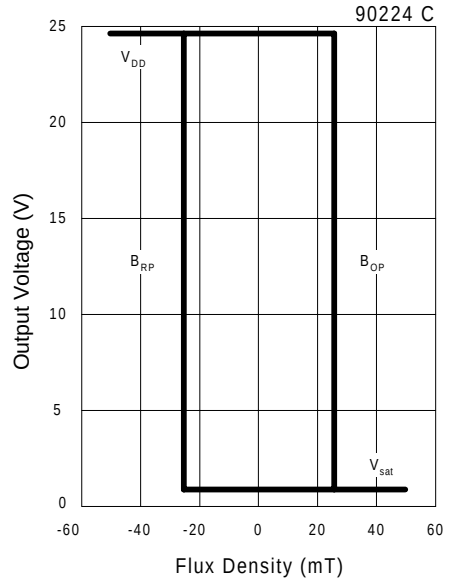
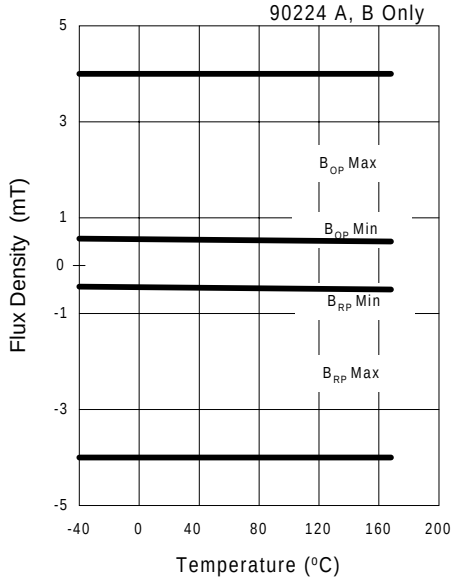
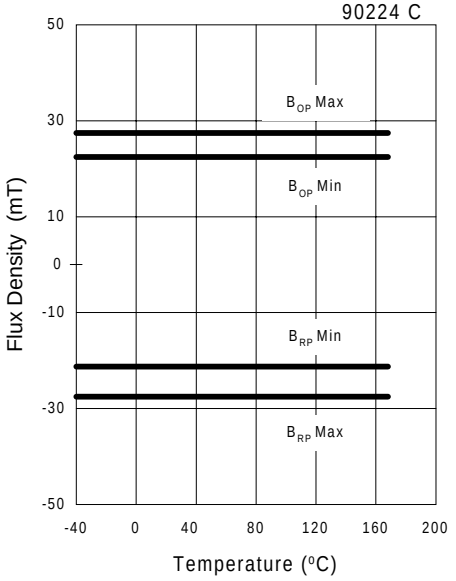


Performance Graphs

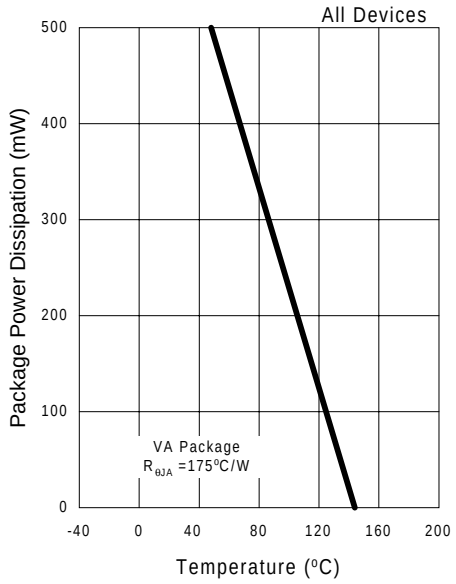
Min/Max Magnetic Switch Range versus Temperature



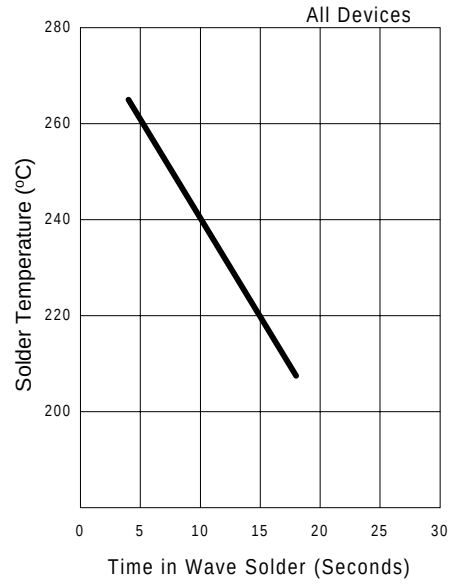
Min/Max Magnetic Switch Range versus Temperature



Power Dissipation versus Temperature



Wave Soldering Parameters



General Description

The MLX 90224 Speed and Direction Sensor is designed for use with Multipole ring magnet targets having evenly distributed North and South magnetic poles on the circumference of the magnet. An example of the basic physical arrangement of the sensor and magnet is shown in Fig. 1. The MLX90224 is available in 3 versions. The first version will provide the user with two digital output signals. Output S1 will provide a speed pulse from the changing magnetic flux at sensing element S1. Output S2 will provide a phase shifted output identical in pulse width and period to S1. This version is referred to as MLX90224 A. The MLX90224 B version will provide an output signal that decodes the phase shifted signals to directly provide an output for the speed which is twice the natural frequency of the alternating magnetic field from the pole spacing of the multipole ring magnet. The other output pin will represent the direction and will change from logic high to logic low when the direction of rotation of the magnet is reversed. This then allows to directly see the condition of the speed with twice the resolution of the MLX90224 A and to also know directly the direction of rotation of the target. The third version of this product the MLX90224 C will be identical in function of the A but with less sensitive magnetic switch points. The MLX90224 A has Latching magnetic Bop and Brp values of typically +/- 2mT as does the internal circuitry of the B. The C version has also Latching magnetic trip points but with the thresholds set to +/- 25mT.

Typical Application

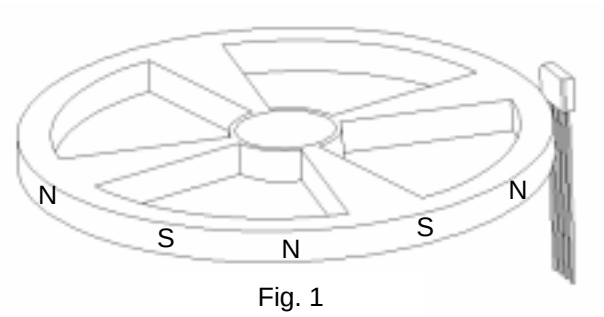


Fig. 1

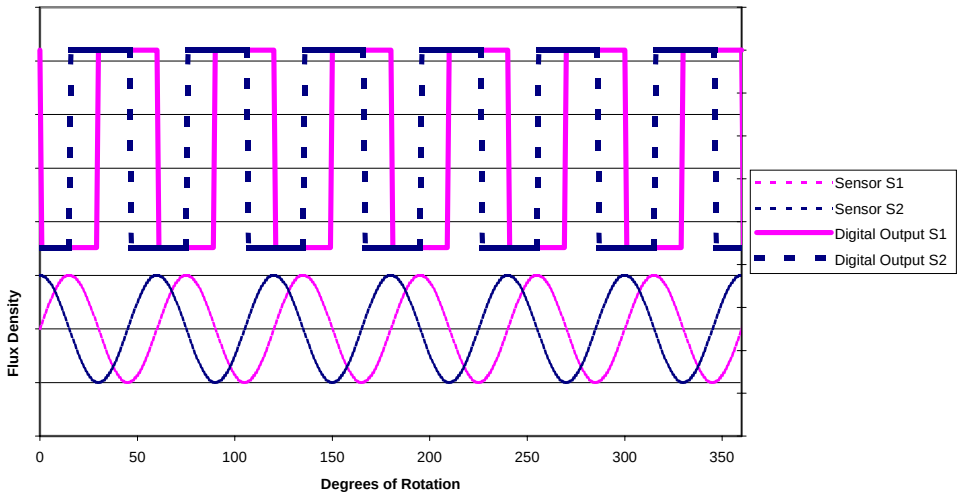
Cross Reference

The MLX90224LVA can replace the following Hall effect devices: Allegro A3421KA /A3422KA

Absolute Maximum Ratings

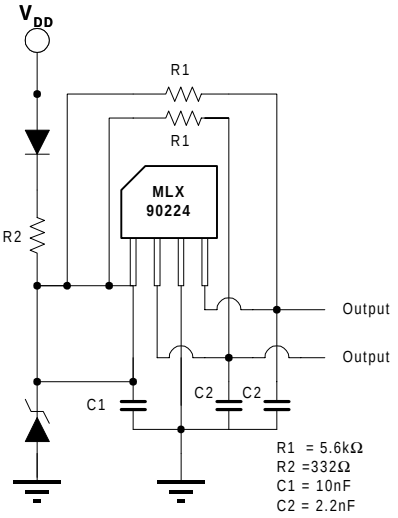
Supply Voltage (Operating), V_{DD}	30V
Reverse Voltage Protection	30V
Supply Current, I_{DD}	50mA
Output "On" Current, Io	50mA
Power Dissipation, P_D	300mW
Operating Temperature Range, T_A	-40°C to 150°C
Storage Temperature Range, T_S	-65°C to 165°C
Maximum Junction Temp, T_J	+175°C
ESD Sensitivity	+/- 7KV

Multipole Ring Magnet and MLX90224BA or BC



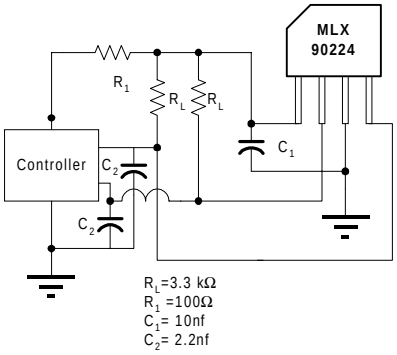
Application Notes

Severe Environment and Automotive Protection Circuit

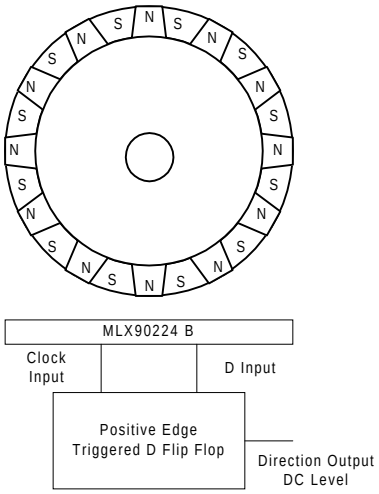


In severe cases it may be necessary to include a Zener diode to clamp positive interference and Schottky diodes to clamp negative excursions.

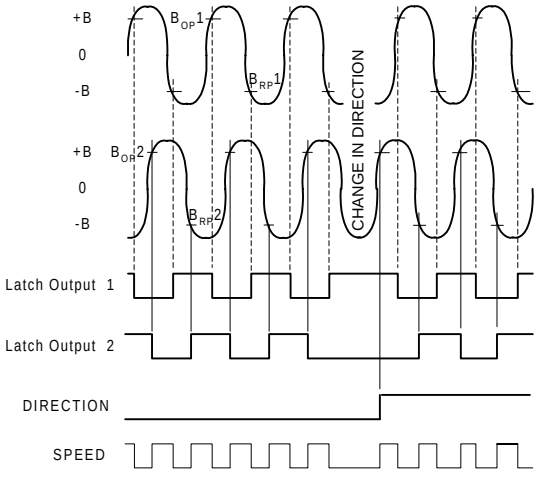
Microcontroller Application Schematic with EMC Protection



Direction-Detection Circuit

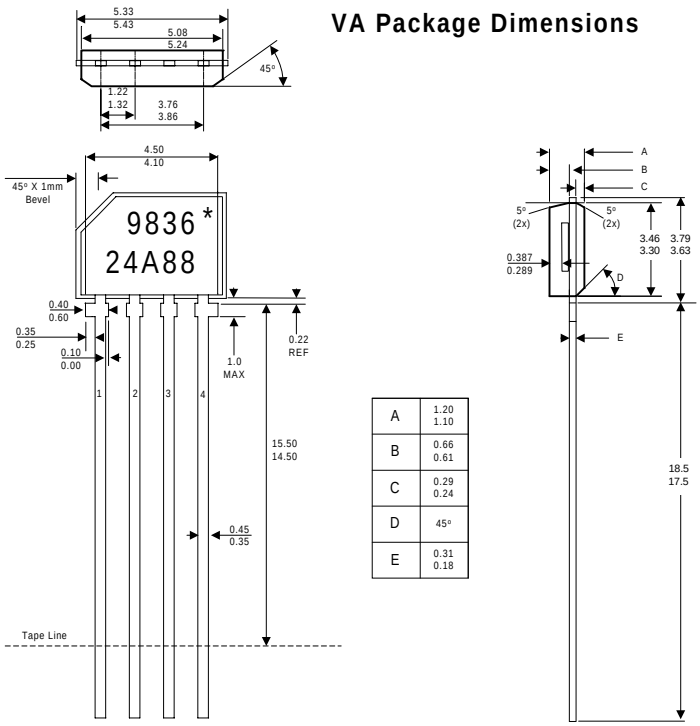


Timing Diagram



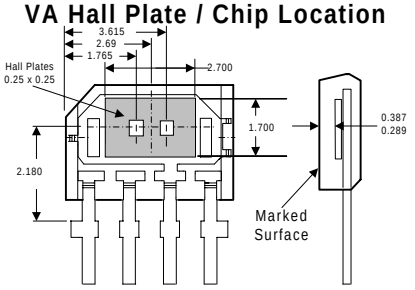
Physical Characteristics

VA Package Dimensions



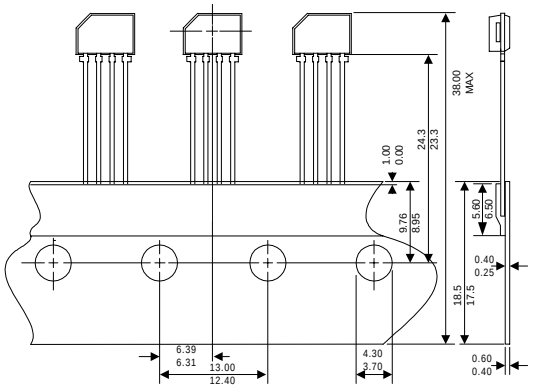
A	1.20 1.10
B	0.66 0.61
C	0.29 0.24
D	45°
E	0.31 0.18

VA Hall Plate / Chip Location



All Dimensions in millimeters

VA Tape Dimensions



* MARKING:
Line 1:
1st and 2nd digits (98) = Year (1998)
3rd and 4th digits (36) = Week of Year

Line 2:
1st and 2nd digits (15) = Chip I.D. (90224)
3rd digit (A) = Chip Revision
4th and 5th digits(88) = Lot Number

PINOUT:
Pin 1 V_{DD}
Pin 2 Output 1
Pin 3 GND
Pin 4 Output 2

NOTES:
1.) Controlling dimension: mm
2.) Leads must be free of flash and plating voids
3.) Leads must not arc toward the rear of package
4.) Lead frame material: EFTEC 64T
5.) Molding compound: Sumitomo EME 6300H
6.) Package dimensions exclude molding flash
7.) Tolerance is 0.254mm unless otherwise specified

For more information, please contact:

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